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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,512	02/17/2004	Tai-Chun Huang	TS03-461	1383
42717	7590	09/19/2005	EXAMINER	
HAYNES AND BOONE, LLP 901 MAIN STREET, SUITE 3100 DALLAS, TX 75202			CHU, CHRIS C	
			ART UNIT	PAPER NUMBER
			2815	
DATE MAILED: 09/19/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/780,512

Applicant(s)

HUANG ET AL.

Examiner

Chris C. Chu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 June 2005.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 25 is/are pending in the application.
4a) Of the above claim(s) 4, 9 - 15 and 24 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1 - 3, 5 - 8, 16 - 23 and 25 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on June 29, 2005 has been received and entered in the case.

Election/Restrictions

2. Applicant argues that claims 4 and 24 are directed to subject matter present in the elected species of Figure 8B, whereas claims 3 and 23 are not directed to subject matter present in the Figure 8B. This argument is not persuasive because the original limitation "said first width of said seal ring covering the whole of said corner portion of said seal ring" of claims 4 and 24 read on Species II (Fig. 7) not in Fig. 8B. Therefore, claims 4, 9 – 15 and 24 have been treated as a non-elected Species and are hereby withdrawn from consideration consistent with the election that filed on January 21, 2005 as addressed in the previous Office action.

Thus, the requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 2, 6 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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- (A) In claims 2 and 20, the term "sharp" is a relative term which renders the claim indefinite. The term "sharp" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.
- (B) In claim 6, the term "about" is a relative term which renders the claim indefinite. The term "about" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Applicant arguments against the terms "sharp" and "about", since applicant merely argues the Office action in a general manner rather than pointing out specific location in the specification that provide any indication as to what range of specific activity is covered by the terms "about" and "sharp", the argument is not persuasive.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

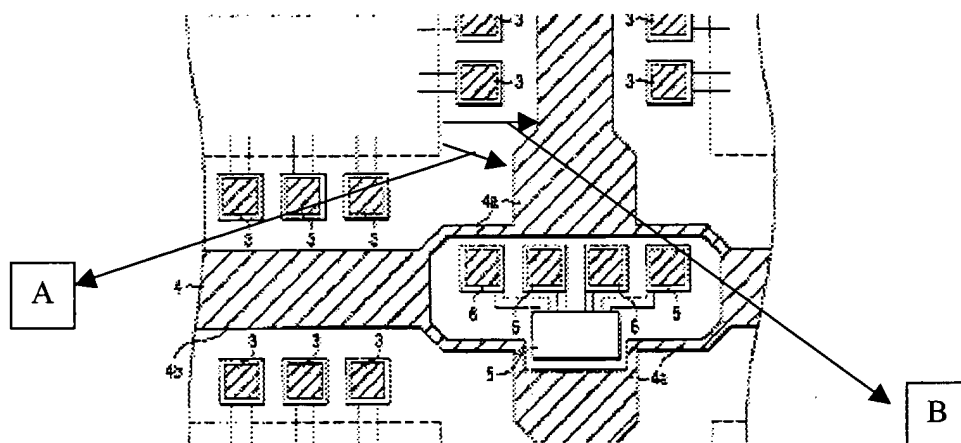
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 16, 18, 21 – 23 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Tsuji et al. (U. S. Pat. No. 6,291,835).

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Regarding claim 16, Tsuji et al. discloses in Figure and column 2, lines 45 – 67 a semiconductor device (1; column 2, line 46) comprising:

- semiconductor device structures (any structures inside of the element 4) formed in and on a substrate; and
- a seal ring (4; column 1, line 58 – 60 and Figure show corners and sides of four chips that are separated by the lines 4. Thus, the lines 4 that cover the every corners and sides of a single chip's board lines read as a continuous seal ring.) enclosing said semiconductor device structures forming a single die (2; column 2, line 51),
- wherein a first distance (A) between said semiconductor device structures and a corner portion of said seal ring is smaller than a second distance (B) between said semiconductor device structures and an edge portion of said seal ring (see Figure below).



Regarding claim 18, Tsuji et al. discloses in Figure said semiconductor device structures including all active devices of said semiconductor device (column 2, lines 44 – 51) except for devices used for temperature testing (Since applicant does not specifically claim that the

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“devices used for temperature testing” is for a semiconductor die, a reasonable interpretation of the term “devices used for temperature testing” includes any thermo-devices, e.g., thermometers or heat sensors for reactors or furnace or air conditioner, etc., that locate outside of the die and inside of a factory).

Regarding claim 21, Tsuji et al. discloses in Figure said corner portion (4a; column 2, line 54) of said seal ring (4) having a first width and wherein said edge portion (4b; column 2, line 55) of said seal ring has a second width wherein said first width is wider than said second width (see Figure and column 2, lines 54 – 56).

Regarding claim 22, Tsuji et al. discloses in Figure said first width being “about” 1.5 times said second width or greater (column 2, lines 61 – 63).

Regarding claim 23, Tsuji et al. discloses in Figure only a portion of said corner portion of said seal ring having a width wider than said second width (see the Figure).

Regarding claim 25, Tsuji et al. discloses in Figure one or more slots or holes (at the area where the elements 5 and 6 are formed) being formed in said corner portion (4a) of said seal ring (4).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. Claims 1 – 3, 5 – 8, 17, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. (U. S. Pat. No. 6,291,835) in view of Ma et al. (U. S. Pat. No. 6,509,622).

Regarding claim 1, Tsuji et al. discloses in Figure and column 2, lines 45 – 67 a seal ring structure comprising:

- a substrate (1; column 2, line 46);
- a plurality of layers of metal lines (4a and 4b; column 2, lines 52 – 63) formed overlying said substrate; and
 - o wherein said plurality of metal lines (4a and 4b) forms a continuous seal ring (column 1, line 58 – 60 and Figure show corners and sides of four chips that are separated by the lines 4. Thus, the lines 4 that cover the every corners and sides of a single chip's board lines read as a continuous seal ring.) around a die (2; column 2, line 51) and
 - o wherein a first width (4a; column 2, line 54) of said metal lines at a corner of said die is wider (column 2, lines 52 – 63) than a second width (4b; column 2, lines 55 – 56) of said metal lines at edges of said die (see the Figure).

While Tsuji et al. teaches a plurality of metal lines on top layer of the substrate, Tsuji et al. does not appear to provide a plurality of layers of metal lines and a plurality of metal vias. Ma et al. teaches in e.g., Fig. 2 a plurality of layers of metal lines (205 – 209; column 3, lines 29 – 30) formed overlying a substrate and a plurality of metal vias (211 – 215; column 3, lines 30 – 32) through intermetal dielectric layers (column 3, lines 40 – 45) between the layers of metal lines, wherein said metal vias (211 – 215) interconnect said metal lines (see e.g., Fig. 2) and

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wherein said plurality of layers of interconnected metal lines forms a continuous seal ring (105 in Fig. 1A and column 2, lines 55 – 56) around a die (103; column 2, line 55). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to apply the plurality of layers of metal lines and the plurality of metal vias between the metal lines and the substrate of Tsuji et al. to decrease a mechanical failure of the devices or the interconnects due to a mechanical stress, such as interconnect shearing, by providing the high shear strengthened plurality of guard rings (column 1, lines 24 – 34 and column 4, lines 1 – 2).

Regarding claim 2, Tsuji et al. discloses in Figure said metal lines (4a and 4b) being parallel to said edges (the broken lines in the element 1) of said die (2) and wherein said metal lines are sloped at said corner of said die so that said metal lines do not have a “sharp” corner (see Figure).

Regarding claim 3, Tsuji et al. discloses in Figure only a portion of said corner having a width wider than said second width (see Figure).

Regarding claim 5, Tsuji et al. discloses in Figure one or more slots or holes (at the area where the elements 5 and 6 are formed) being formed in said first width (4a) of said metal lines at said corner (see Figure).

Regarding claim 6, Tsuji et al. discloses in Figure said first width (4a) being “about” 1.5 times said second width (4b) or greater (column 2, lines 61 – 63).

Regarding claim 7, Tsuji et al. discloses in Figure semiconductor device structures within said die (2) wherein a first distance between said semiconductor device structures and a corner portion of said seal ring is smaller than a second distance between said semiconductor device structures and an edge portion of said seal ring.

Regarding claim 8, Tsuji et al. discloses in Figure all active semiconductor device structures in said die are located within said seal ring and wherein devices involved in temperature testing (i.e., thermometers or heat sensors in the wafer assembly process in a semiconductor factory) may be located outside of said seal ring (Since applicant does not specifically claim that the “devices involved in temperature testing” is for a semiconductor die, a reasonable interpretation of the term “devices involved in temperature testing” includes any thermo-devices, e.g., thermometers or heat sensors for reactors or furnace or air conditioner, etc., that locate outside of the die and inside of a factory).

Regarding claim 17, Ma et al. teaches in e.g., Fig. 2 semiconductor device structures (devices; column 2, lines 56 – 59) including gate electrodes, source and drain regions (since the devices include transistors, Ma et al. discloses the claimed structures), and a plurality of layers of interconnected conductive lines (201; column 3, lines 29 – 32).

Regarding claim 19, a further difference between Tsuji et al. and instant invention is said seal ring (4) comprising:

- a plurality of layers of metal lines formed on said substrate; and
- a plurality of metal vias through intermetal dielectric layers between said layers of metal lines
 - o wherein said metal vias interconnect said metal lines and
 - o wherein said plurality of layers of interconnected metal lines forms a continuous seal ring around said die.

Ma et al. teaches in e.g., Fig. 2 a plurality of layers of metal lines (205 – 209; column 3, lines 29 – 30) formed on a substrate and a plurality of metal vias (211 – 215; column 3, lines 30

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– 32) through intermetal dielectric layers (column 3, lines 40 – 45) between the layers of metal lines, wherein said metal vias (211 – 215) interconnect said metal lines (see e.g., Fig. 2) and wherein said plurality of layers of interconnected metal lines forms a continuous seal ring (105 in Fig. 1A and column 2, lines 55 – 56) around a die (103; column 2, line 55). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to apply the plurality of layers of metal lines and the plurality of metal vias between the metal lines and the substrate of Tsuji et al. to decrease a mechanical failure of the devices or the interconnects due to a mechanical stress, such as interconnect shearing, by providing the high shear strengthened plurality of guard rings (column 1, lines 24 – 34 and column 4, lines 1 – 2).

Regarding claim 20, Tsuji et al., as modified, discloses said interconnected metal lines being parallel to said edges of said die and wherein said interconnected metal lines are sloped at said corner of said die so that said interconnected metal lines do not have a “sharp” corner.

Response to Arguments

9. Applicant's arguments filed June 29, 2005 have been fully considered but they are not persuasive.

On page 15, applicant argues that Tsuji does not disclose any seal ring because the element 4 of Tsuji is a scribed line not a seal ring. This argument is not persuasive. Tsuji discloses in column 1, lines 42 – 44 and column 2, lines 52 – 58 that the element (4) is an aluminum layer which surrounds each one of chips on a semiconductor integrated circuit board (1) for separating the chips and securing a large effective area for the chip when the chip is cut out. This indicates that the element (4) has same function as the seal ring or guard ring which

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secures a large effective area of the chip from outside environment. Thus, the element (4) of Tsuji reads as the seal ring or guard ring.

Further, applicant argues that the elements 211 – 215 of Ma are not vias. This argument is not persuasive. First, Ma clearly discloses in Fig. 2 and column 3, lines 30 and 31 that the elements 211 – 215 are via rings. Second, the definition of term “via” is through the medium or agency of (Merriam-Webster’s Collegiate Dictionary, 10th ed., page 1310). Also, in common use of the term “via” in the art is an opening or a hole. The elements 211 – 215 of Ma are openings or holes that formed between the metal layers 205 – 209 through mediums such as the dielectric materials. Thus, the elements 211 – 215 of Ma read as vias.

Finally, applicant argues that neither Tsuji nor Ma discloses a seal ring in which “a first width of said metal lines at a corner of said die is wider than a second width of said metal lines at edges of said die.” This argument is not persuasive. Tsuji clearly discloses in the figure and column 2, lines 54 – 56 that the corner portions 4a are formed to be wider than the side portion 4b.

For the above reasons, the rejection is maintained.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

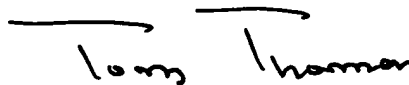
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu
Examiner
Art Unit 2815

c.c.
Wednesday, September 14, 2005


TOM THOMAS
SUPERVISORY PATENT EXAMINER